# Instruction Manual
# LX700

LARSEN & TOUBRO LIMITED

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# Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will L&T be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, L&T cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by L&T with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual we use the following symbols to make you aware of safety considerations.

**WARNING**

Identifies information about practices or circumstances which may lead to serious personal injury or death, property damage, or economic loss.

**IMPORTANT**

Identifies information that is critical for successful application and understanding of the product.

**ATTENTION**

Identifies information about practices or circumstances that can lead to minor personal injury, property damage, economic loss, or product malfunction. However, depending on the situation, failure to follow the directions accompanying this symbol may also lead to serious consequences.

# Safety Instructions

Please read this manual and the related documentation thoroughly and familiarize yourself with product information, safety instructions and other directions before installing, operating, performing inspection and preventive maintenance.
Please be aware that the instructions are marked with either a warning symbol or attention symbol.

**WARNING**

- If this product is used in a situation that may cause personal injury and/or significant product damage, implement safe measures such as use of fault-safe equipment.
- Be sure to cutoff outer power source while wiring, maintenance, and cleaning. Do not touch terminals when electric current is flowing. Otherwise it may cause an electric shock.
- Do not use this product under any conditions exposed to explosive gases. It may cause an explosion.

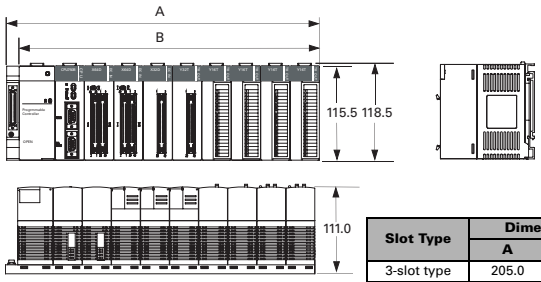
**ATTENTION**

- Use the product under the allowed conditions directed in product specifications and be cautious to keep away extraneous materials from entering the product during installation.
  - Do not expose to high temperature, high humidity, dense dust, salinity, mineral particles, corrosive gas, inflammable gas, solvent, abrasive materials, and direct sunlight.
  - Keep away from vibrations, and contacts of other objects. It is the cause of damage, malfunction, or aging.
- Fasten the terminal screws tightly to ensure that the cable connection is secure. Incorrect cable connection may cause overheating and product malfunction.
- Make sure to use an external device when configuring the protective circuit breakers for emergencies or interlock circuits.
- Operate the product under the allowed conditions directed in product specifications. Incorrect conditions can cause abnormal heat dissipation or product malfunction.
- Do not dissemble or modify the product, or it may cause malfunctions. Use the service centers for product repairs.
- Do not touch the terminals when the power is on. It may cause an electric shock.
- Only use the product for functions explicitly specified in the product and the manual.
- Abide by the industrial waste disposal standard when disposing the product.

# Installation

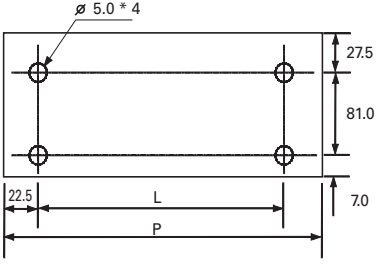
## Installation Dimensions

*LX700 PLC System Dimensions (mm)*




unit (mm)

| Slot Type | Dimensions | |
|---|---|---|
| | A | B |
| 3-slot type | 205.0 | 184.0 |
| 5-slot type | 276.0 | 254.0 |
| 8-slot type | 381.0 | 360.0 |
| 10-slot type | 452.0 | 430.0 |
| 12-slot type | 522.0 | 501.0 |

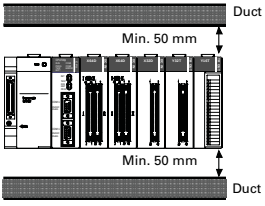


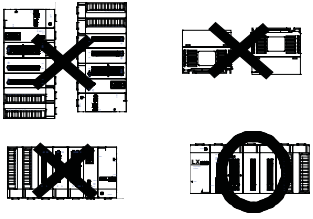

unit (mm)

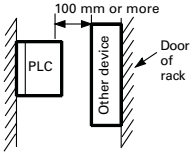
| Slot Type | P | L |
|---|---|---|
| 3-slot type | 205.0 | 153.8 |
| 5-slot type | 276.0 | 224.2 |
| 8-slot type | 381.0 | 329.8 |
| 10-slot type | 452.0 | 400.2 |
| 12-slot type | 522.0 | 470.6 |

## Installation Location

Be sure to maintain a sufficient distance from wiring ducts, and other machines below and above the module for proper ventilation.
Do not install the modules stacked up or horizontally. Doing so will prevent proper cooling of the module and cause overheating inside the PLC (programmable controller).
Do not install the module above devices which generate heat such as heaters, transistors or large scale resistors.
In order to eliminate any effects from noise emission, power wires and electromagnetic devices should be kept at least 100 mm away from the surfaces of the module. When installing the module behind the doors of the operation panel, be especially careful to maintain these distances.

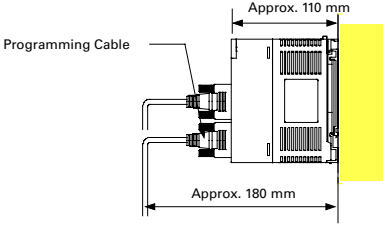





*Space for Programming Tool Connection*

Leave a space of at least 180 mm from the mounting surface for programming tool connections and wiring.



## Installation Environment and Precaution

**ATTENTION**

Do not install your multi-wire link modules if any of the following conditions are present:

- Ambient temperature out of the range of 0 to 55 °C (32 to 131 °F)
- Humidity out of the range of 30% to 85% (non-condensing)
- Inflammable or corrosive gases
- Excessive or conductive dust, metal particles, or salinity
- Chemicals that may affect electronic parts
- Benzene, thinner, alcohol, other organic solvents or strong alkaline solutions such as ammonia or caustic soda
- High voltage, strong magnetic fields, or strong electromagnetic influences
- Direct impact and excessive vibration
- Sudden temperature changes causing condensation
- Direct sunlight
- Location near high-tension wires, high-voltage devices, power cables, power devices, or other devices with generate large power surges or electronic fields when starting and stopping (esp. if within 100 mm)

**ATTENTION**

*Precautions for Electrostatic Discharges*

Excessive static electricity can be generated in dry conditions, so please make sure to discharge electrostatic charges by touching a grounded metal bar before contacting the module.

**ATTENTION**

*Contacting the Module*

Do not use thinners, which can damage or degrade PCB circuit board.

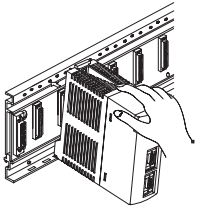
*Proper Compressed Connection Terminal*

- Circular type terminal (O type Lug)
- Circular type terminal with insulation resistance
- Open type terminal (Y type Lug)

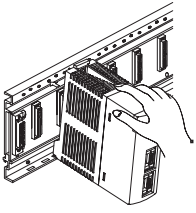
## Mounting/Dismounting Module

*Mounting*

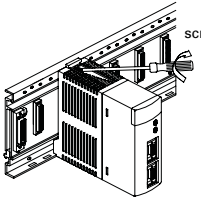
1. Insert the module by inserting the tab into the groove first and pushing the module against the backplane.



2. Push the top of the module toward the backplane until it is clamped in place.

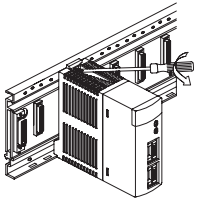


4. Ensure that the module is in place against the backplane, and then fasten the screw using a screwdriver.

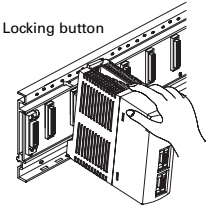



*Dismounting*

1. Unfasten the screw that holds the module in place using a screwdriver.

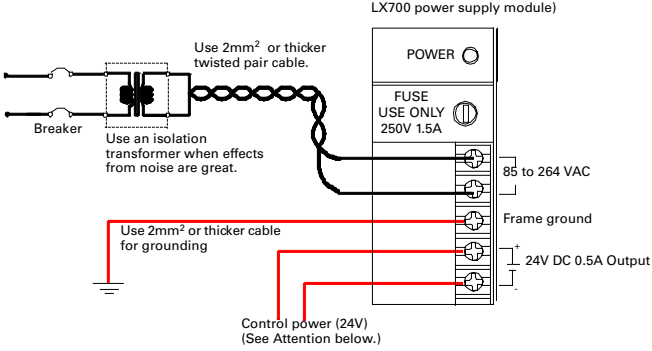


3. Hold on pressing the locking button on the top edge of the module, and pull the module from the backplane



# Wiring

## Power Supply Module Wiring




**ATTENTION**

*Control Power (24V)*

24V can be supplied to an I/O Module.

Must avoid parallel connections with other 24V power supply modules or with other power supply modules.

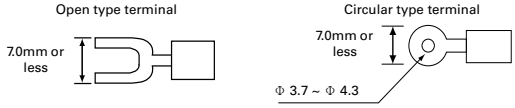
*Allowable Voltage Range of the Power Supply Module*

The power supply voltage connected to the power supply module must be within allowable limits.

| Catalog number | Rated input voltage | Allowable voltage range | Remarks |
|---|---|---|---|
| LX-POWER | 110 to 220V ac | 85V to 264V ac | LX700 Power Supply Module |

*Terminal for the Power Supply Module*

- The terminal screw M3.5 is recommended.
- The compressed connection terminal is recommended for the wiring.

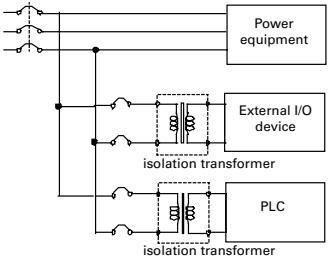



*Use 2mm$^2$ or Thicker Twisted Pair Cable*

- Use power supply wire that is thicker than 2mm$^2$ to minimize voltage drops.
- Use twisted pair cable to minimize noise effects.

*Power Supply System*

Use separate wiring systems for the PLC system, external I/O devices, and power equipment as shown in the following diagram.



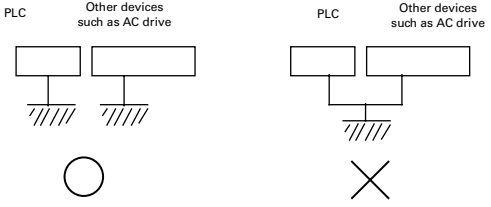

*Use Isolation Transformer in Noisy Environments*

- Use a low noise power supply.
- Use an isolation transformer to reduce the noise as illustrated above.

## Grounding

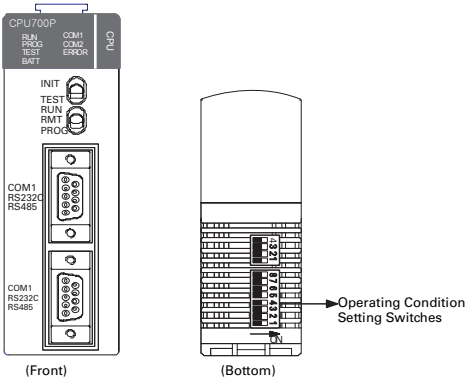
*Grounding the PLC in Noisy Environments*

- Connected to the metal part of backplane, the frame ground terminal is connected to a solid earth ground.
- Use ground wires with a minimum of $2mm^2$ and the triple grounding connection which has a resistance of less than 100 Ω.
- The point of grounding should be as close to the PLC as possible and the ground wire should be as short as possible.
- If two devices share a single ground point, it may produce an adverse effect. Always use an exclusive ground for each device.



# Operating Condition Setting

## LX-CPU700p Processor Module




### Operating Condition Setting Switches

*Switch for Termination Resistance Setting (DIP Switch 1)*

| Pin No. | Pin setting (Pin No.) | | Description | DIP Switch 1 |
|---|---|---|---|---|
| 4, 3 | ON (4) | ON (3) | For RS-485 communication, set both pins 3 and 4 to On if the system is a termination station. (Enables termination for COM1 terminal) | |
| | OFF (4) | OFF (3) | For RS-485 communication, set both pins 3 and 4 to Off if the system is not a termination station. (Disables termination for COM1 terminal) | |
| 2, 1 | ON (2) | ON (1) | For RS-485 communication, set both pins 1 and 2 to On if the system is a termination station. (Enables termination for COM2 terminal) | |
| | OFF (2) | OFF (1) | For RS-485 communication, set both pins 1 and 2 to Off if the system is not a termination station. (Disables termination for COM2 terminal) | |

*Switch for Communication and Program Booting Method Setting (DIP Switch 2)*

| Pin No. | Pin setting (Pin No.) | | Description | DIP Switch 2 |
|---|---|---|---|---|
| 8, 7 | OFF (8) | OFF (7) | Sets the communication speed on COM2 terminal to 9600 bps | |
| | ON (8) | OFF (7) | Sets the communication speed on COM2 terminal to 19200 bps | |
| | OFF (8) | ON (7) | Sets the communication speed on COM2 terminal to 38400 bps | |
| | ON (8) | ON (7) | Sets the communication speed on COM2 terminal to 4800 bps | |
| 6, 5 | OFF (6) | OFF (5) | Sets the communication speed on COM1 terminal to 9600 bps | |
| | ON (6) | OFF (5) | Sets the communication speed on COM1 terminal to 19200 bps | |
| | OFF (6) | ON (5) | Sets the communication speed of COM1 terminal to 38400 bps | |
| | ON (6) | ON (5) | Sets the communication speed on COM1 terminal to 4800 bps | |
| 4 | ON (4) | | Selects RS-485 communications for COM1 | |
| | OFF (3) | | Selects RS-232C communications for COM1 | |
| 3 | ON (3) | | Selects RS-485 communications for COM2 | |
| | OFF (3) | | Selects RS-232C communications for COM2 | |
| 2 | OFF (2) | | Always set to Off. (Reserved for system setting) | |
| 1 | ON (1) | | Loads the program from EEPROM (flash ROM) at power-on. | |
| | OFF (1) | | Operates the system with the program in RAM at power-on. | |

# Input/Output Modules

The following table shows the general I/O modules that can be used in an LX700 PLC system whose processor module is LX-CPU700p. For more information on these I/O modules, refer to the LX700 Plus System (LX-CPU700p) User Manual.

Besides those I/O modules, a wide range of special modules including A/D, D/A, RTD, TC conversion modules are available. For more information on the special modules that can be used in an LX700 PLC system, refer to the LX700 Plus System (LX-CPU700p) User Manual and the installation instructions and user manual for each module.

| Category | Catalog number | Description |
|---|---|---|
| Digital input | LX-X16D | 16-point 12 to 24V dc input |
| | LX-X32D | 32-point 12 to 24V dc input |
| | LX-X64D | 64-point 12 to 24V dc input |
| | LX-X16A110 | 16-point 100 to 120V ac input |
| | LX-X16A220 | 16-point 200 to 240V ac input |
| Digital output | LX-Y16R | 16-point 2A 250V ac/30V dc relay output |
| | LX-Y16RV | 16-point 2A 250V ac/30V dc relay output with varistor as surge absorber |
| | LX-Y32RV | 32-point 1A 250V ac/30V dc relay output with varistor as surge absorber |
| | LX-Y16T | 16-point 12 to 24V dc transistor output (NPN) |
| | LX-Y32T | 32-point 12 to 24V dc transistor output (NPN) |
| | LX-Y64T | 64-point 12 to 24V dc transistor output (NPN) |
| | LX-Y16SSR | 16-point 100 to 240V ac SSR output |

## Digital Input Module Specifications

| Input type | | DC Input | | | AC Input | |
|---|---|---|---|---|---|---|
| Catalog number | | LX-X16D | LX-X32D | LX-X64D | LX-X16A110 | LX-X16A220 |
| Number of input points | | 16 points | 32 points | 64 points | 16 points | |
| Insulation method | | Photocoupler | | | | |
| Rated input voltage | | 12 to 24V dc | | | 100 to 120V ac | 200 to 240V ac |
| Operating voltage range | | 10.2 to 26.4V dc | | | 85 to 132V ac | 170 to 264V ac |
| Max. input current | | 10 mA or less (at 24V) | | | 20 mA or less | |
| ON voltage/ current | | Min. 9.6V | | | Min. 80V/ 6 mA | Min. 160V/ 6 mA |
| OFF voltage/ current | | Max. 2.5V | | | Max. 30V/ 3 mA | Max. 50V/ 3 mA |
| Input impedance: | | Approx. 3KΩ | | | Approx. 15KΩ | Approx. 20KΩ |
| Response time | OFF → ON | 10 ms or less | | | 15 ms or less | |
| | ON → OFF | 10 ms or less | | | 20 ms or less | |
| Internal current consumption (5V) | | 65 mA or less | 130 mA or less | 250 mA or less | 60 mA or less | |
| Common method | | 8 points/1 COM (Common for polarity +, -) | 32 points/1 COM (Common for polarity +, -) | | 8 points/1 COM | |
| Operation indicator | | LED | | LED (indication by 32 points conversion) | LED | |
| External cable connection type | | Removable terminal block (M3.5, 20 pins) | Connector (40 pin x 1 EA) | Connector (40 pin x 2 EA) | Removable terminal block (M3.5, 20 pins) | |
| Recommended cable size | | 0.5 to 1.25 $mm^2$ | 0.2 $mm^2$ | | 0.5 to 1.25 $mm^2$ | |
| Weight | | 170 g | 140 g | 200 g | 200 g | |
| Type | | (A) Type | (B) Type | (C) Type | (A) Type | |

# Digital Relay Output Module Specifications

| Output type | | Relay Output | | |
|---|---|---|---|---|
| Catalog number | | LX-Y16R | LX-Y16RV | LX-Y32RV |
| Number of output points | | 16 points | | 32 points |
| Insulation method | | Photocoupler | | |
| Rated load voltage | | 2A 250V ac, 2A 30V dc | | 1A 250V ac,<br>1A 30V dc |
| Response time | OFF → ON | 10 ms or less | | |
| | ON → OFF | 10 ms or less | | |
| Life time | Mechanical | 30 million times | | |
| | Electric | 200 thousand times | | |
| External power supply | | 24V 150 mA or less | | |
| Surge protection | | None | Varistor | |
| Internal current consumption (5V) | | 120 mA or less | | 180 mA or less |
| Common method | | 8 points/1COM | | 32 points/1COM |
| Operation indicator | | LED | | |
| External cable connection type | | Removable terminal block (M3.5, 20 pins) | | Connector<br>(40 pin x 1 EA) |
| Recommended cable size | | 0.5 to 1.25 $mm^2$ | | 0.2 $mm^2$ |
| Weight | | 225 g | 235 g | 300 g |
| Type | | (A) Type | | (B) Type |

## Digital Transistor Output Module Specifications

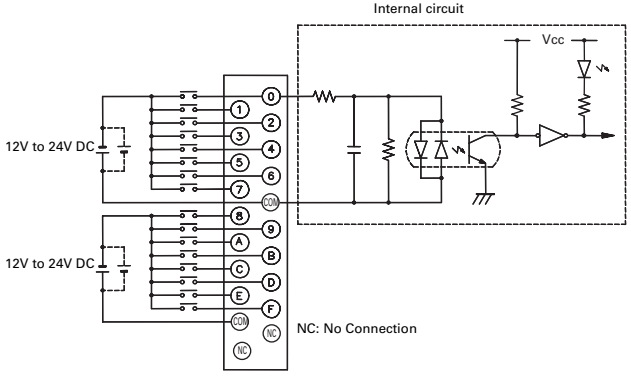
| Output type | | Transistor Output | | |
|---|---|---|---|---|
| | | NPN | | |
| Catalog number | | LX-Y16T | LX-Y32T | LX-Y64T |
| Number of input points | | 16 points | 32 points | 64 points |
| Insulation method | | Photocoupler | | |
| Rated load voltage | | 12 to 24V dc | | |
| Operating load voltage range | | 10 to 30V dc | | |
| Max. load current | | 0.6A/point | 0.4A/point | 0.2A/point |
| OFF state leakage current | | 100 $\mu$A or less | | |
| Response time | OFF → ON | 1 ms or less | | |
| | ON → OFF | 1ms or less | | |
| Internal current consumption (5V) | | 120 mA or less | 180 mA or less | 250 mA or less |
| Surge absorber | | Zener diode | | |
| Common method | | 8 points/1COM | 32 points/1COM | |
| Operation indicator | | LED | | LED (indication by 32 points conversion) |
| External cable connection type | | Removable terminal block (M3.5, 20 pins) | Connector (40 pin x 1 EA) | Connector (40 pin x 2 EA) |
| Recommended cable size | | 0.5 to 1.25 $mm^2$ | 0.2 $mm^2$ | |
| Weight | | 170 g | 140 g | 205 g |
| Types | | (A) Type | (B) Type | (C) Type |

## Digital SSR Output Module Specifications

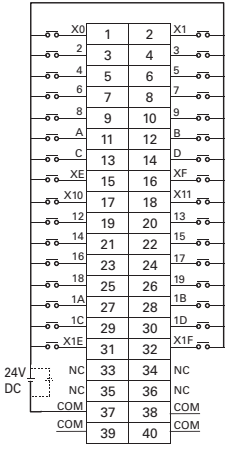
| Output type | | SSR Output |
|---|---|---|
| Catalog number | | LX-Y16SSR |
| Number of input points | | 16 points |
| Insulation method | | SSR |
| Rated load voltage | | 100 to 240V ac |
| Operating load voltage range | | 85V to 264V ac |
| Max. load current | | 0.5A/point |
| OFF state leakage current | | 100 $\mu$A or less |
| Response time | OFF → ON | 1ms or less |
| | ON → OFF | 0.5 cycle + 1 ms or less |
| Internal current consumption (5V) | | 250 mA or less |
| Fuse rating | | 3A |
| Common method | | 8 points/1 COM |
| Operation indicator | | LED |
| External cable connection type | | Removable terminal block (M3.5, 20 pins) |
| Recommended cable size | | 0.5 to 1.25 $mm^2$ |
| Weight | | Approx. 240 g |
| Type | | (A) Type |

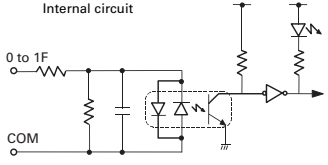
# Input/Output Module Wiring Diagrams

## LX-X16D Wiring Diagram



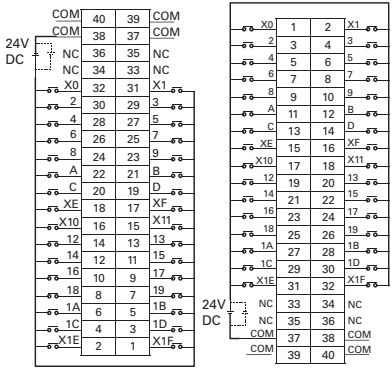

## LX-X32D Wiring Diagram



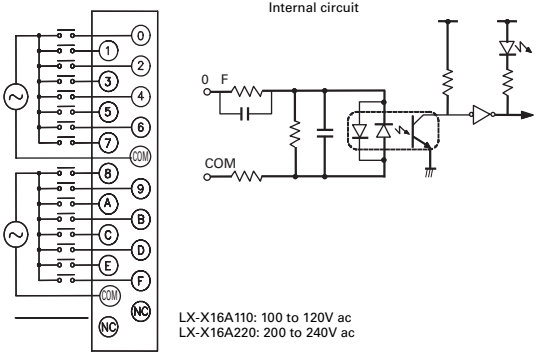

- The COM terminal of a connector has a short inside of the unit.
- For more information on wiring method, refer to the LX700 Plus System (LX-CPU700p) User Manual.
- Use separate commercial cable harness (LX-CBLDC) and Pin Type Ass'y (LX-PIN40) for external connection.
- NC: No Connection

## LX-X64D Wiring Diagram



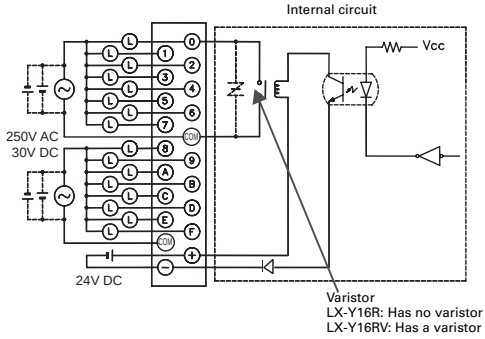

- The internal circuit is the same with LX-X32D.
- The connectors [I] and [II] have opposite orientation each other, so be careful with wiring.
- The COM terminal of the connector has a short inside of the unit.
- For more information on wiring method, refer to the LX700 Plus System (LX-CPU700p) User Manual.
- Use separate commercial cable harness (LX-CBLDC) and Pin Type Ass'y (LX-PIN40) for external connection.
- NC: No Connection

## LX-X16A110 and LX-X16A220 Wiring Diagram

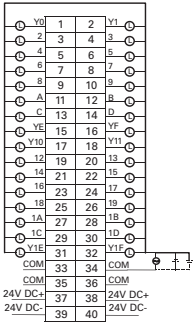



LX-X16A110: 100 to 120V ac
LX-X16A220: 200 to 240V ac

## LX-Y16R and LX-Y16RV Wiring Diagram

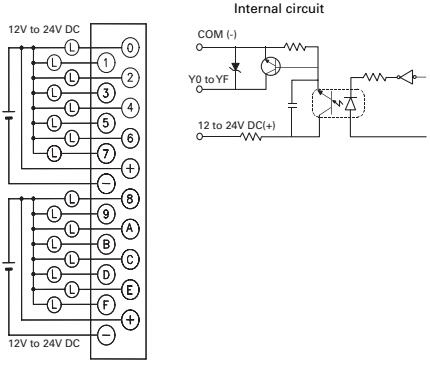



## LX-Y32RV Wiring Diagram

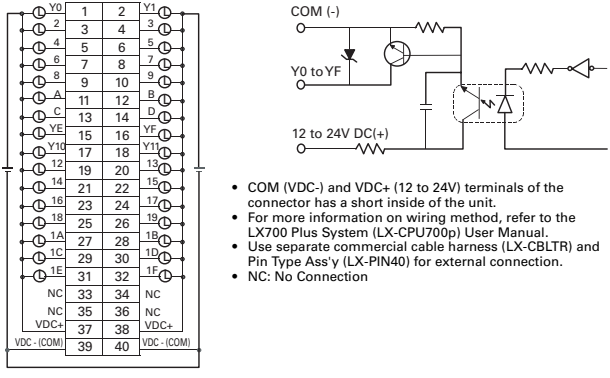



- The internal circuit is the same with LX-Y16RV.
- The COM terminal of the connector has a short inside of the unit.
- For more information on wiring method, refer to the LX700 Plus System (LX-CPU700p) User Manual.
- Use separate commercial cable harness (LX-CBLRY) and Pin Type Ass'y (LX-PIN40) for external connection.

## LX-Y16T Wiring Diagram

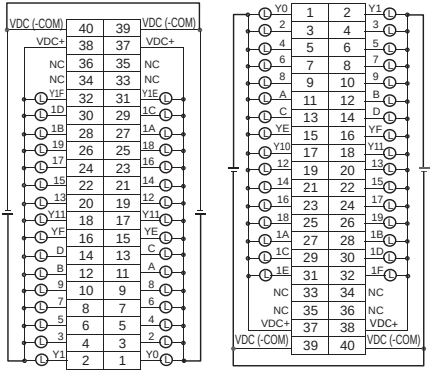



## LX-Y32T Wiring Diagram



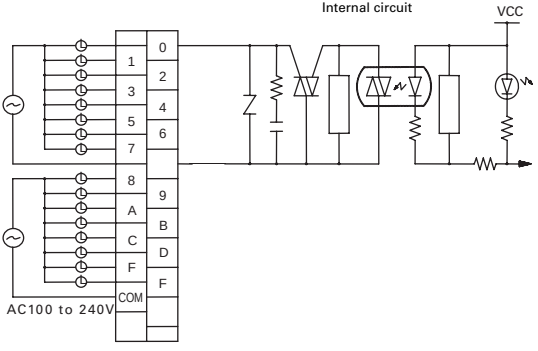

- COM (VDC-) and VDC+ (12 to 24V) terminals of the connector has a short inside of the unit.
- For more information on wiring method, refer to the LX700 Plus System (LX-CPU700p) User Manual.
- Use separate commercial cable harness (LX-CBLTR) and Pin Type Ass'y (LX-PIN40) for external connection.
- NC: No Connection

## LX-Y64T Wiring Diagram




- The internal circuit is the same with LX-Y32T..
- COM (VDC-) and VDC+ (12 to 24V) terminals of the connector has a short inside of the unit.
- For more information on wiring method, refer to the LX700 Plus System (LX-CPU700p) User Manual.
- Use separate commercial cable harness (LX-CBLTR) and Pin Type Ass'y (LX-PIN40) for external connection.
- NC: No Connection

## LX-Y16SSR Wiring Diagram



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